CLAIMS:

[c01] 1. A transistor switch for a system operating at high frequencies, the transistor switch comprising:

a graded channel region between a source region and a drain region, the graded channel region configured for providing a low resistance to mobile negative charge carriers moving from the source region to the drain region; wherein the graded channel comprises at least two doping levels.

[c02] 2. The transistor switch of claim 1, wherein doping level at the source region is higher than doping level at the drain region.

[c03] 3. The transistor switch of claim 1, wherein a gate region extends along a side wall of the graded channel.

[c04] 4. The transistor switch of claim 1, wherein the transistor switch is implemented using a wide bandgap material with a high thermal conductivity.

[c05] 5. The transistor switch of claim 4, wherein the wide band gap material is selected from the group consisting of silicon carbide, gallium nitride, aluminum nitride, boron nitride, and diamond.

[c06] 6. The transistor switch of claim 1, wherein the graded channel comprises three doping levels.

[c07] 7. The transistor switch of claim 6, wherein the doping levels of the graded channel are 10^{15} electrons/cm^3, 10^{16} electrons/cm^3, and 10^{17} electrons/cm^3.

[c08] 8. The transistor switch of claim 1, wherein the doping level of the source region and the drain region is 5×10^{18} electrons/cm^3 respectively.

[c09] 9. The transistor switch of claim 1, wherein the doping level of the gate region is 5×10^{18} holes/cm^3.

[c10] 10. The transistor switch of claim 1, wherein the transistor switch operates at a frequency of at least 1MHz.

[c11] 11. The transistor switch of claim 1, wherein the transistor switch operates at a frequency of more than 68 MHz.

[c12] 12. The transistor switch of claim 1, wherein the breakdown voltage of the transistor switch is more than 60 Volts.

[c13] 13. The transistor switch of claim 12, wherein the breakdown voltage of the transistor switch is 210 Volts.

[c14] 14. The transistor switch of claim 1, wherein the transistor switch is implemented in high power generating systems.

[c15] 15. The transistor switch of claim 1, wherein the transistor switch comprises a static induction transistor.

[c16] 16. A static induction transistor for a system operating at high frequencies, the static induction transistor comprising:

a graded channel region between a source region and a drain region, the graded channel region configured for providing a low resistance to mobile negative charge carriers moving from the source region to the drain region; wherein the graded channel comprises at least two doping levels, wherein doping level at the source region is higher than doping level at the drain region; and wherein a gate region extends along the sides of the graded channel.

[c17] 17. The static induction transistor of claim 16, wherein the graded channel comprises three doping levels.

[c18] 18. The static induction transistor of claim 17, wherein the doping levels of the graded channel are 10^{15} electrons/cm^3, 10^{16} electrons/cm^3, and10^{17} electrons/cm^3.

[c19] 19. The static induction transistor of claim 16, wherein the doping level of the source region and the drain region is 5 X 10^{18} electrons/cm^3 respectively.

[c20] 20. The static induction transistor of claim 16, wherein the doping level of the gate region is 5 X 10^{18} holes/cm^3.

[c21] 21. The static induction transistor of claim 16, wherein the static induction transistor operates at a frequency of at least 1MHz.

[c22] 22. The static induction transistor of claim 16, wherein the static induction transistor operates at a frequency of more than 68 MHz.

[c23] 23. The static induction transistor of claim 16, wherein the breakdown voltage of the static induction transistor is more than 60 Volts.

[c24] 24. The static induction transistor of claim 23, wherein the breakdown voltage of the static induction transistor is 210 Volts.